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Two new species of *Plagiostachys* (Zingiberaceae) from Sabah, Borneo

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Summary. Two new species of ginger, *Plagiostachys lasiophylla* and *P. oblanceolata*, are described from Sabah.

Including the new species *P. lasiophylla* and *P. oblanceolata* presently described, Borneo now has 12 known species of *Plagiostachys*. This number, however, is likely to increase as *Plagiostachys* is poorly studied in Borneo (Cowley, 1999). The problem is not only because *Plagiostachys* is not collected much but its mucilaginous inflorescence and fragile flower render its study difficult (Smith, 1985; Cowley, 1999). Recently, a preliminary assessment of the molecular phylogeny of *Alpinia*, including two species of *Plagiostachys* (Kress *et al.*, 2005), showed that *Plagiostachys* and a number of other taxa now placed in *Alpinia* appeared to be specially related and distinct from another group that contained the type species of *Alpinia*. Thus, it would appear that the status of *Plagiostachys* as a monophyletic group will require further confirmation. Despite this situation, we are able to recognize the two new species here because they are sufficiently distinct from the other 10 known species of *Plagiostachys* in Borneo. We believe it is important to name the new species so that they can be referred to easily when the genus is revised.

In general, *Plagiostachys* has been distinguished from other Zingiberaceae by its inflorescence that penetrates to the outside through the basal or middle sheaths of its

pseudostem (Smith, 1985). In Borneo, *Plagiostachys* has been divided informally into groups with mucilaginous or non-mucilaginous inflorescences (Smith, 1985). In a recent account, Sakai & Nagamasu (2003) placed three species, *P. albiflora* s.l., *P. crocydocalyx* (K. Schum.) Burtt & R.M. Smith and *P. glandulosa* S. Sakai & Nagamasu in the group with mucilaginous inflorescences, and another seven species, namely, *P. parva* Cowley, *P. breviramosa* Cowley, *P. bracteolata* R.M. Smith, *P. strobilifera* (Bak.) Ridley, *P.* sp. nov. and *P.* aff. *strobilifera* of R.M. Smith (1985: 271–272), and *P.* cf. *parva* of Cowley (1999: 142) in the group with non-mucilaginous inflorescences. Of these species, *P. glandulosa*, *P.* sp. nov., and *P.* aff. *strobilifera* have not been recorded in Sabah. Both the presently described species have non-mucilaginous inflorescences.

Plagiostachys lasiophylla J.Gobilik & A.Lamb **sp. nov.** *affine P. parva Cowley sed petiolis brevibus ad obsoletis, laminis anguste lanceolatis lanuginosis marginibus undulatis, et labello ovato-oblongo differt. Typus*: *Malaysia, Sabah, Sandakan, cult. Forest Research Centre (ex Sg. Sapi),* Lamb *AL515/2003 (holotypus SAN, isotypus K).*

(Fig. 1)

Terrestrial herb, erect. Subterranean rhizomes between pseudostems 10–15 cm long with (0.5–)1–2(–3) cm long internodes; bracts brown, hairy and papery when dry. Leafy shoots (20–)30–40(–50) cm tall; leaf sheaths green, densely hairy except the margin; bladeless sheaths 8–18 cm long; ligules 0.2–0.5 cm long, apex round or truncate to emarginate, green, densely hairy. Leaves with developed blades 5–11 per leafy shoot, crowded at the distal portion to only about 1 cm apart; petioles very short to absent; blades progressively longer and broader from the base to the apex of a shoot, the largest at the shoot tip narrow-lanceolate to linear, 19.5–29 × 1.9–2.9 cm, the basal ones ovate to broadly lanceolate, 1–5.2 cm × 0.7–2 cm, densely hairy all over including on margin and apex, base cuneate, apex acuminate with tips to 1.6 cm long, leaf margin regularly and consistently undulating. Inflorescence 2 cm long, emerging 2–3 cm above the base of the leafy shoot, densely hairy, hairs translucent; peduncle 0.5(–1) cm long; bracts 1.5 × 0.7 cm, ovate, sheathing, brown, hairy, apices acuminate with 0.5–2 cm long tips; bracteoles 1 × 0.5 cm with occasionally tubular base, pink, hairy, partially decayed at fruiting stage. Flower 3.2–3.5 cm long, densely hairy; calyx 1.6 cm long, tubular, apex trilobed, lobes 0.2–0.5 cm long with acute tips, pink to red, densely hairy; corolla tube 2.5–2.6 cm long, red, outer surface densely hairy, inner surface glabrous except for a hairy band at 0.5–0.6 cm from its top; dorsal petal oblong, 0.7–0.9 × 0.4–0.5 cm, hooded to about 0.2 cm deep, red, densely long-hairy; lateral petals lanceolate, 0.6–0.7 × 0.3 cm, slightly hooded, connected to the base of the labellum, red, densely long-hairy; labellum ovate, 0.8–1.2 × 0.5–0.6 cm, apex emarginate, dark red, glabrous; lateral staminodes oblong, 0.2(–0.4) × 0.1 cm; anther oblong, 0.5 × 0.3 cm, red, hairy; anther crest broadly acute, undivided, tridentate or unequally emarginate, 0.1 × 0.2 cm; filament 0.1 cm long to nearly absent, hairy; stigma capitate, dark red, margin with fine hairs; style 3 cm long, glabrous except the apical 0.5 cm with sparse hairs, connate to

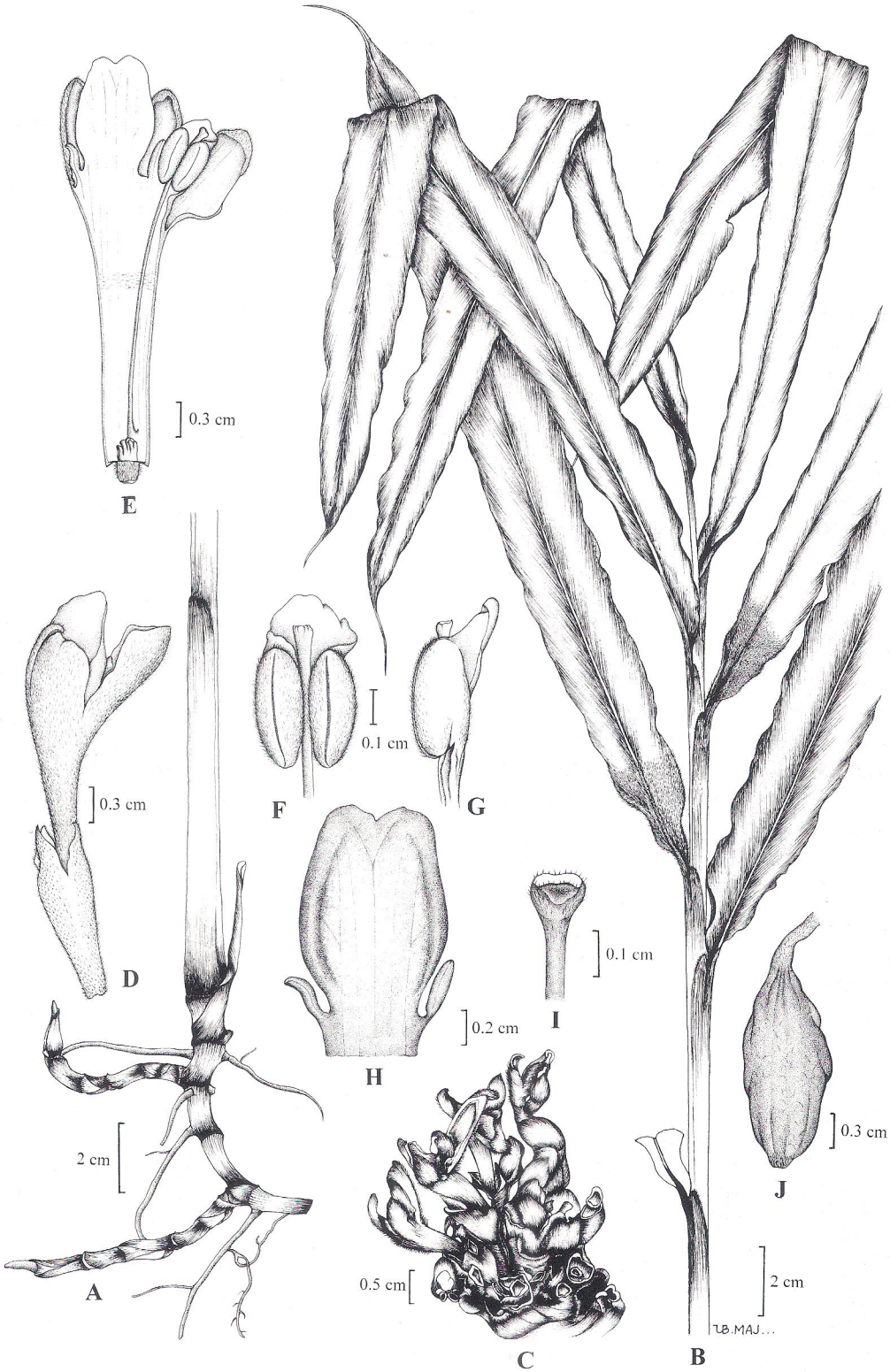

Fig. 1. *Plagiostachys lasiophylla*. **A.** Base of leafy shoot. **B.** Top of leafy shoot. **C.** Inflorescence. **D.** Flower. **E.** Dissected flower with calyx removed. **F–G.** Anther showing anther crest and position of style and stigma (front and side views, respectively). **H.** Labellum (seen from above). **I.** Stigma. **J.** Fruit. All drawn from *AL515/2003* by Ubaldus Majawal.

corolla tube wall at 0.1 cm above the epigynous glands; epigynous glands fist-like, 0.2 × 0.1 cm, apex slightly tridentate, not enveloping the style; ovary 0.2–0.3 × 0.2 cm, hairy. Fruit oblong-ovate, 1.6–1.7 × 0.6 cm, ridged, densely hairy, with 1-cm-long decayed calyx on the top.

DISTRIBUTION. So far known only from Sabah in the Sg. Sapi area, Sandakan district, and the Tabin Wildlife Reserve (km 16 and km 22 along the road to the core area), Lahad Datu district. Cultivated at the Forest Research Centre (FRC), Sandakan.

ECOLOGY. Lowland primary or secondary forests, on wet or muddy soils adjacent to streams.

SPECIMENS EXAMINED—BORNEO. SABAH: Sandakan, Sepilok, cult. Forest Research Centre (*ex* Sg. Sapi), *Lamb* AL515/2003 (holotype SAN, isotype K); Lahad Datu, Tabin Wildlife Reserve, *Gobilik* 392, 655 (AAU, E, K).

Of the known *Plagiostachys* species in Borneo, *P. lasiophylla* is closely similar to *P. parva* Cowley. The species are both less than 60 cm tall, have completely reddish inflorescence and non-fleshy calyces, the inflorescences are very close to the base of the leafy stem, and the styles connate to the corolla tube wall just above the epigynous glands. *P. lasiophylla* is distinct by its very short to nearly non-existent petioles, narrowly lanceolate to linear leaves, cuneate leaf base, and green young leaves, whereas *P. parva* has petioles 0.6-4.5 cm long, broad ovate to oblong leaves, cordate leaf base, and pinkish young leaves. In addition, *P. lasiophylla* is densely hairy all over compared to *P. parva*, which is also hairy but has glabrous upper leaf surfaces. Differences between these species are highlighted in Table 1.

Plagiostachys oblanceolata J. Gobilik & A. Lamb **sp. nov.** *affine P. lasiophylla J.Gobilik & A.Lamb sed laminis oblanceolatis, glabris supra, marginibus non undulatis et labello elliptico differt. Typus*: *Malaysia, Sabah, Sandakan, Gobilik 1006 (holotypus SAN, isotypi E, K).*

(Fig. 2)

Terrestrial herb, erect. Subterranean rhizomes between pseudostems 5–12 cm long with (0.5–)1–2(–3) cm long internodes and with hairy stout roots; bracts brown, papery, margin hairy. Leafy shoots (15–)40–50(–60) cm tall; leaf sheaths green, glabrous, margin densely hairy; bladeless sheaths 2–29 cm long; ligules 0.2 cm long to absent, bilobed, green, densely hairy. Leaves 3–5 per leafy shoot; petiole absent; blade oblanceolate, 34.4–38 × 5.8–8.1 cm, glabrous except pubescent on lower leaf surfaces, margins and apices, base cuneate, leaf margin plane, apex acuminate with tip 1.6 cm long, young leaves pinkish. Inflorescence 1.5–2 cm long, emerging 3 cm above the base of the leafy shoot, pubescent; peduncle 0.5(–1) cm long; bracts 1.5–2.5 × 0.6 cm, ovate, sheathing, pink-reddish to brown, glabrous,

Table 1. Comparison of some key characteristics of *Plagiostachys lasiophylla*, *P. oblanceolata* and *P. parva*.

Characters	*P. lasiophylla*	*P. oblanceolata*	*P. parva*
Plant height	(20–)30–40(–50) cm	(15–)40–50(–60) cm	to 60 cm
Hairiness	densely hairy on all parts; relatively long hairs (> 1 mm long)	glabrous, except lower side of leaves and inflorescence pubescent	densely hairy, except glabrous upper leaf surface; short hairs (< 1 mm long)
No. of leaves	5–11	3–5	2–5
Petiole	very short to absent	absent long,	0.6–4.5 cm
Young leaf colour	green	pinkish	pinkish
Lamina shape, size	narrow-lanceolate/ linear, 19.5–29 × 1.9–2.9 cm	oblanceolate, 34.4–38 × 5.8–8.1 cm	broad ovate to oblong, 11–27 × 4.5–10.5 cm
Lamina margin	regularly undulate	plane	plane
Leaf base	cuneate	cuneate	asymmetric cordate
Calyx length	longer than bracteole, 1.6 cm	longer than bracteole, 2.2–2.5 cm	equal to bracteole, 1.1 cm
Corolla tube length	2.5–2.6 cm	3.2 cm	2 cm
Labellum	0.8–1 × 0.5–0.6 cm, ovate to oblong, apex emarginate	1.0 × 0.6 cm, elliptic, apex emarginate	0.6 × 0.4 cm, rounded, apex bilobed
Lateral staminodes	oblong	oblong	spathulate
Anther crest	undivided	undivided	bilobed
Style	not exceeding the level of the anther	not exceeding the level of the anther	exceeding the level of the anther by 0.2 cm

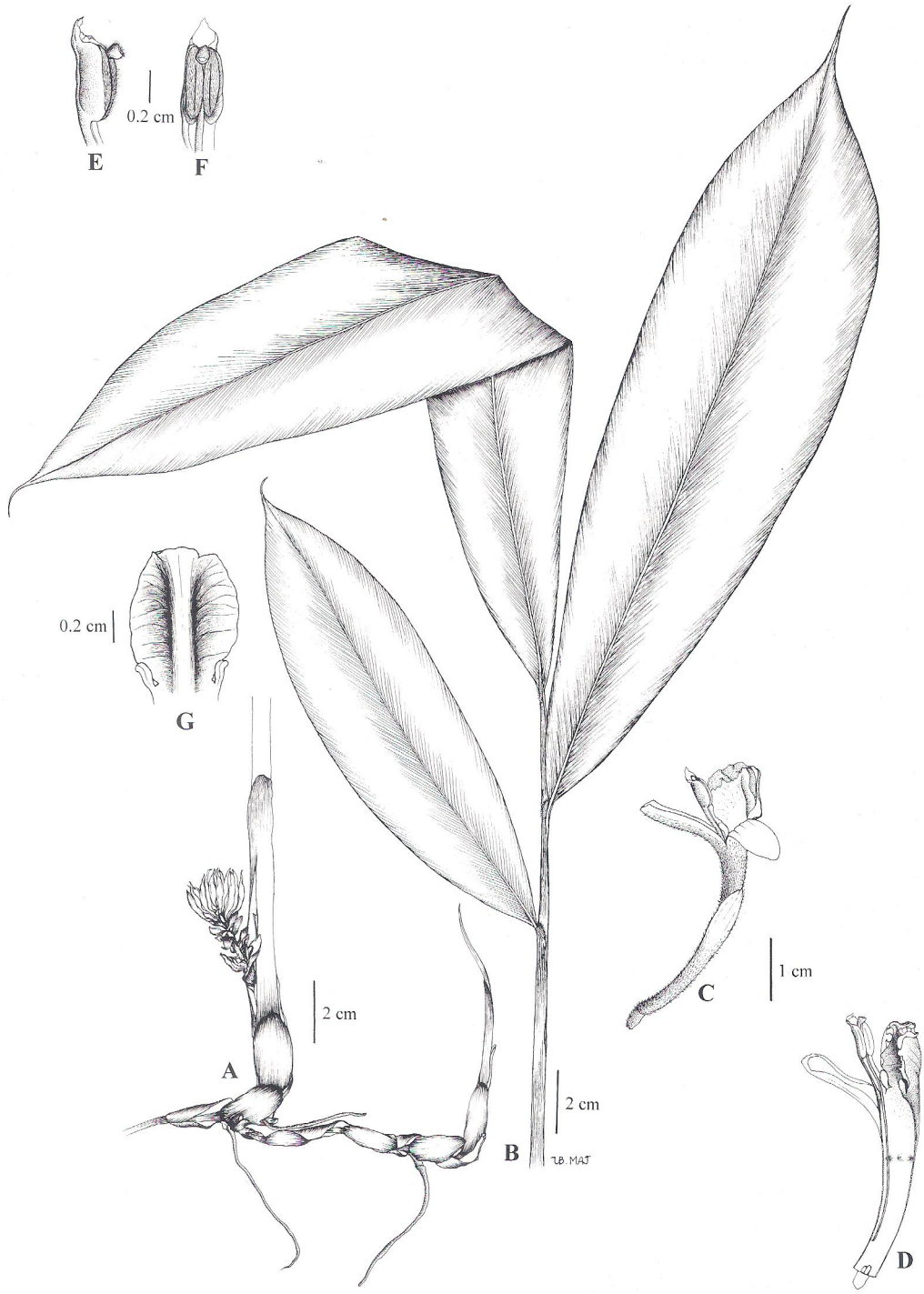

Fig. 2. *Plagiostachys oblanceolata*. **A.** Base of leafy shoot with emerging inflorescence. **B.** Top of leafy shoot. **C.** Flower. **D.** Dissected flower with calyx removed. **E–F.** Anther showing anther crest and position of style and stigma (side and front views, respectively). **G.** Labellum (seen from above). All drawn from *Gobilik 1006* by Ubaldus Majawal.

apices acuminate with 0.3–0.5-cm-long tips; bracteoles 1 × 0.4 cm, pink, pubescent, base tubular and about 0.2 cm long, apices partially dried. Flower 4.0 cm long, pubescent; calyx 2.2–2.5 cm long, tubular with slanted mouth, pink to red, pubescent, apex obtuse and partially dried; corolla tube 3.2 cm long, red, outer surface pubescent, inner surface glabrous except for a hairy band at 0.6–0.7 cm from its top; dorsal petal oblong, 1–1.2 × 0.4 cm, apex obtuse, red, pubescent; lateral petals oblong, 0.8 × 0.4 cm, apex obtuse, connected to the labellum at 0.2 cm from the base of the labellum, red, pubescent; labellum elliptic, 1.0 × 0.6 cm, apex emarginate, dark red, glabrous; lateral staminodes oblong, 0.2 × 0.1 cm; anther oblong, 0.5 × 0.4 cm, red, glabrous except the edges of the anther thecae and base of the anther crest; anther crest undivided to unequally emarginate, 0.2 × 0.2 cm, apex acute, glabrous; filament 0.4 cm long, glabrous; stigma capitate, dark red, margin with fine hairs; style 3 cm long, glabrous except the apical 0.5 cm pubescent, connate to corolla tube wall at 1 cm above the epigynous glands; epigynous glands oblong, 0.1 x 0.1 cm, not enveloping the style, apex truncate; ovary 0.2 × 0.2 cm, pubescent. Fruits red, with sparse short hairs.

DISTRIBUTION. So far known only from Sg. Imbak, Sandakan District, Sabah.

ECOLOGY. Lowland primary forest, often in forest gaps.

SPECIMENS EXAMINED—BORNEO. SABAH: Sandakan, Imbak Valley, Sg. Imbak, *Gobilik 965* (SAN) *& 1006* (holotype SAN; isotypes E, K); Tawau, Kalabakan, Asiatic Lumber S/B Logging Area, mile 30 of road to Keningau, *Gobilik 1025* (SAN with material in spirit; E).

The closest species to *P. oblanceolata* is *P. lasiophylla*. *P. oblanceolata* differs from *P. lasiophylla* in having longer, oblanceolate and broad leaves, glabrous leaf sheaths and upper leaf surfaces, pinkish to dark purple young leaves, longer calyces and corolla tubes, dorsal and lateral petals that are not hooded, an elliptic labellum, glabrous filaments, and style that is connate with the corolla tube wall at 1 cm above the oblong epigynous glands. In contrast, *P. lasiophylla* has shorter narrowly-lanceolate and narrower leaves, densely hairy leaf sheaths and both leaf surfaces, greenish young leaves, shorter calyces and corolla tubes, dorsal and lateral petals that are hooded, an ovate labellum, hairy filaments, and style that is connate with the corolla tube just above the fist-like epigynous glands. In addition, the regularly wavy leaf lamina margin of *P. lasiophylla* is highly diagnostic, allowing easy distinction from *P. oblanceolata*.

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